Employment of the Blind

WV1945
N

M.C. MIGEL LIBRARY
AMERICAN PRINTING
HOUSE FOR THE BLIND

N.I.B. BULLETINS
No. 1.

EMPLOYMENT OF THE BLIND

Employment of Blind Persons in Ordinary Factories and Workshops.

Sub-contracting as a means of finding New Occupations.

Price 3d.

Published by the
NATIONAL INSTITUTE FOR THE BLIND
(Registered under the Blind Persons Act, 1920)
224-6-8, Great Portland Street, London, W.1

HV1945
N
copy 4

FOREWORD

IN 1927 the National Institute for the Blind constituted an Appointments Board of business men who were willing to give their special knowledge to help their blind fellow countrymen, in extending the range of employments open to them. The Appointments Board soon saw the necessity of carrying out Research into the whole question, and the National Institute for the Blind accordingly appointed a Committee which, under the name of the Placement Committee, has since been carrying out Research work into the whole problem.

The field of Research was wide. Parts of it had been worked to exhaustion. Large tracts had scarcely been touched. The early stages of the work were slow and difficult. The preconceptions and prejudices which limited thought on the employability of the blind generally to such traditional occupations as the making of baskets and mats had to be cleared away. On the other hand, the practical lessons to be learnt from the lives of exceptionally gifted blind people had to be studied in their bearing on the education of those blind persons who, without being geniuses, were of more than average ability. One of the first steps taken was to engage the services of the National Institute of Industrial Psychology, and the Committee owes much of the progress which it has been able to make to the insight and precision of that Institute's investigators.

The work of the Placement Committee will be reported in a series of Bulletins, the first of which is dated April, 1930. It is proposed to issue other Bulletins as the material becomes ripe for reporting and to add to the Committee from time to time as the scope of its work is increased.

The Committee at present is composed of Sir James Devonshire, K.B.E.; A. Eichholz, C.B.E., M.A.,M.D.; P. M. Evans, M.A., LL.D.; James Graham, M.A., Ph.D.; the Rev. E. H. Griffiths, M.A.; A. J. W. Kitchin, C.I.E., B.A.; F. R. Lovett, M.B.E., M.A.; G. F. Mowatt, J.P.; C. S. Myers, C.B.E., M.D., Sc.D., F.R.S.; Sir Michael O'Dwyer, G.C.I.E., K.C.S.I., B.A.; Captain G. Pollard, O.B.E.; J. M. Ritchie, M.A., Ph.D.; Miss Jean Robinson; Captain Sir Beachcroft Towse, V.C., K.C.V.O., C.B.E.; T. H. Tylor, M.A., B.C.L.; H. J. Wagg, O.B.E.; Captain H. Willans, D.S.O., M.C.; W. McG. Eagar, B.A., Secretary-General, National Institute for the Blind; C. B. Fox, B.Sc., National Institute of Industrial Psychology; E. J. Pyke, M.A. (Secretary to the Committee), Technical Officer, National Institute for the Blind; and Miss Johns, Placement Officer, National Institute for the Blind.

Employment of the Blind

I.
The Field of Research.

The field of research was divided, for practical convenience, into five main sections.

(1) Examination of present day blind workshop methods with regard to :—
(*a*) Management. (*b*) Marketing.

(2) Possibility of developing new industries in existing workshops for the blind, or in connection with them.

(3) Possibility of developing new industries on a sub-contracting basis, either in existing workshops or in workshops for the blind designed for manufacturing articles or components used by " ordinary " industrial firms.

(4) Discovery of operations or processes suitable for the blind in factories employing sighted labour.

(5) Means of increasing the number of blind entrants into the profession, *i.e.*, into professions already known to be suitable, or into others not hitherto entered by the blind.

The sections are set out above in the logical order of approach. Certain considerations however dictated rather a different order in practical working, and, partly for that reason and partly because certain fundamental questions of psychology are best treated in connection with the placement of blind persons with seeing persons in ordinary factories and workshops, this first Bulletin will confine itself to the sections numbered (4) and (3) above.

II.
Employment of Blind Persons in Ordinary Factories and Workshops.

The Committee's attention was first directed to the fact that in the U.S.A. and, more extensively and

systematically, in Germany, employment is found for a considerable number of blind people in "ordinary" factories and workshops, which in the rest of this Bulletin will for convenient distinction from "blind workshops" be referred to as "sighted" factories or workshops. It found, however, that in America the shortage of labour acted as a powerful inducement to employers to find possible occupations for blind persons, and that in Germany conditions peculiarly favourable to the employment of the blind were created by the Disablement Law of 1923, which provided that in any workshop 2% of the employees must be severely disabled or blind persons.

None the less, the experience of Germany and the U.S.A. is significant as it proves that there are occupations open to the blind other than those which have now become almost traditional, *e.g.*, basket making, brush making, knitting, weaving, rug making. Moreover, as the existing workshops for the blind have constant difficulty in disposing of their products in the face of machine-made goods and foreign competition, there is clear need of new openings for employment outside blind workshops, as well as for new trades in blind workshops.

Before examining the first of these needs something must be said on the attitude of the prospective blind employee and employer.

The Employee's Point of View.

The present blind workshop system provides sheltered employment in certain industries, even if those industries themselves are subject to normal competition. The workers' real earnings are supplemented by augmentation* in order that his handicap may be compensated and his wages raised, at any rate, to the level of bare subsistence. He will therefore be

* *Augmentation* is a sum of money in addition to wages paid by the employing workshop or agency. The amount is theoretically sufficient to compensate the economic handicap of blindness. The object is to raise the earnings to the level of a living wage. Grants to agencies for the blind to enable them to pay augmentation are made by most local authorities.

uninfluenced by some, at any rate, of the work-a-day incentives of industrial life, but any lack of incentive must be expected to affect him as it would affect sighted workers. In other words, there will be some " triers " who work to full capacity but generally a rather low level of effort.

On the other hand, in a workshop for the blind there is positive advantage of continuity of employment under the direction of people specially experienced in the needs of blind persons and, on the whole, it is probable that the concentration of the blind in workshops is suited to the psychological needs of many of them, though here and there will be found individuals who would benefit from the " rough and tumble " of a less sheltered life.

Probably most of those who are already employed in workshops for the blind would not care to find employment outside, and if this is so, the search for additional employments chiefly concerns the next generation of blind persons.

The Employer's Attitude.

But assuming that a considerable number of blind persons can be found suitable for employment in ordinary life, what is the employer's attitude ? It appears from enquiries that the following factors influence the employer in refusing to consider the employment of blind persons :—

(a) The lay-out of his factory may not be suitable for the employment of blind persons.

(b) The processes in his factory to which blind persons may be put are perhaps limited, and he desires the " handy-man " type of employee. The employment of a blind person might even necessitate a certain amount of re-organisation: for example, the processes upon which the blind are engaged, would often have to be early processes of a series, as finishing processes often involve visual inspection : moreover,

relative speed of output in consecutive processes is of vital importance in organising production.

(c) Extra insurance (Employers' Liability) and safeguards might be necessary.

(d) Longer time may have to be spent in training the blind workers, and the employer suspects that the resulting efficiency will not be sufficiently high.

(e) It is possible that the placing of blind persons singly or even in pairs in ordinary factories will result in a feeling of strain due to the rush of the factory and the isolation.*

Positive Advantages.

None of these objections on the part of potential employees or employers are insuperable. There are on the other hand definite and positive advantages to be gained by the blind from working under ordinary conditions, *e.g.*, the benefits of wider social contacts, increased output through competition and suggestion, and a greater sense of independence and "victory over blindness." These points are of first rate importance by reason of their bearing on the aim of normalising the lives of the blind. Blind workers in sighted factories are conscious that they are taking an active part in the world's production and that they are engaged on processes similar to sighted workers. Even if the number of processes suitable for blind labour in sighted factories is somewhat limited, it is greater than that available in a blind workshop, and that in itself helps to do away with the feeling of being a special "case."

Experimental Placings.

Having these preliminary psychological considerations in view, the Committee had a number of factories

* This has actually occurred in one case of a girl placed by the National Institute for the Blind.

visited and a list of processes suitable for blind workers prepared. Subsequently posts were obtained for a few blind workers in the following trades :—

Toy Making.

(*a*) Assembling metal stampings for metal toys, such as motor-cars, steam and fire engines.
(*b*) Stamping small parts by means of power driven fly-presses.
(*c*) Stringing toy rackets.

Chocolate Manufacturing.

(*a*) Packing chocolates in cardboard boxes and stringing.
(*b*) Wrapping chocolates and sweets in foil.

Soap Making.

(*a*) Hand wrapping.
(*b*) Cardboard box folding.
(*c*) Ball-cupping, *i.e.*, giving smooth surface to ball-shaped soap.

Earnings.

The wages of the workers have averaged about 2/3rds of those of sighted workers—approximately 15/- per week and in one case 30/- per week. Augmentation has been granted by the National Institute for the Blind at the rate of 12/- per week, so that the worker has obtained approximately 27/- per week in all.

The Problem of Augmentation.

In the course of this experimental placing it became apparent that the majority of suitable processes were those of a repetitive nature usually performed by the lowest paid sighted labour., Usually there were only one or two operations per factory suitable for blind labour and they did not carry a high wage. Augmentation of wages was therefore inevitable. The resources of charitable funds are too small to permit many such placings to be made, and further development in this

direction depends largely on the willingness of Local Authorities to recognise that a blind worker in a sighted factory constitutes as good a case for augmentation of wages as a workshop employee. An approach has already been made to an important Local Authority and sympathetic consideration is being given by it to the case put by the National Institute.

The Problem of Insurance.

In addition to augmentation there is the important point of insuring blind workers against employers' liability for accident.

Enquiries were made from foreign countries, in particular from Germany where Accident Insurance is effected under the Reich Accident Insurance Code through Associations of Employees by whom the funds are contributed. The rules of most of these Associations preclude the employment of a blind person but in consequence of pronouncements by the Reich Insurance Office in 1916 and 1917 the Associations have consented to accept the risk in any case where their own Technical Inspector and the State Factory Inspector have agreed that a particular process or job might be performed by a blind person without special danger.

The above methods are not wholly applicable to this country where insurance against accident is in the hands of private companies.

III.

Sub-contracting as a means of finding New Occupations.

It seems unnecessary in these days to emphasize the importance of a study of workers' individual differences, but it does appear as if much present practice of the workshops for the blind is based on the old belief that any person could in the long run be trained to learn skilled trades such as weaving, basket-making, etc.

The meagre results achieved in many instances are a strong argument for the introduction of tasks of a

lower grade kind such as would be available in a workshop which undertook sub-contracts. It is true that expense would be incurred in equipment and plant, but this would be offset to some extent by the fact that employees would be divided into skilled and unskilled categories, undertaking work for which they were best fitted, with the result that the earnings per head throughout the factory would be increased.

Having considered such prima facie arguments, the Committee thought it desirable to institute an experiment in sub-contracting. The possibility of progress would turn obviously on the willingness of employers to let contracts on reasonable conditions, but first it was necessary to prove to the satisfaction of potential placers of such contracts that there were processes suitable for sub-contracting and that blind workshops were capable of doing work to date and specification.

Experiment in Making "Forms" for Bell Sets.

A definite offer of work for a short period was obtained from the Manager of The Telephone Manufacturing Company of Martell Road, London, who was sympathetic to the object of this work, and, with the co-operation of the London Association for Teaching and Training the Blind, arrangements were made for an experiment to be carried out at the Association's Workshop at Swiss Cottage.

The experiment lasted nearly three months: 12 girls who at that time were under training as knitters were temporarily taken off knitting and instructed in a repetitive process, known as "bell-set forming."

This process is one commonly found in telephone manufacture. It consists in "forming," or fastening together, a number of wires in such a way that when the completed "form" is inserted in the part of the telephone for which it is intended the necessary connections can at once be made. The wires used are of varying length and colours and a wooden board with bolts bored at appropriate points is used to control the positions of each wire in the finished "form." The

wires are threaded through the holes according to a fixed scheme and then bound together with waxed thread.

Details of the Experiment.

Particulars of the experiment are given here in some detail in the hope that they will be of value to any workshop managers who may wish to undertake sub-contracting.

(*a*) A special "forming Board" was constructed so that the "pattern" was more simply arranged.

(*b*) Key positions were indicated by Braille numbers.

(*c*) The seven varying colours of wire were indicated by their consecutive position in a specially constructed apparatus consisting of seven glass bottles inserted in a wooden frame.

The 12 girls were 5 seated at each side of a long table, and 2 at a separate table; one set of bottles served two girls. At each worker's left hand was fixed on the underside of the table a box with a hole in one side through which the string inside the box could pass. Beside this and projecting from the table was screwed a small box to hold the lump of wax with which the string was treated, and a holder into which the pliers used to cut the string could be inserted. Two feet from this, at the worker's right, was another holder for the bradawl used in "forming." The best length of string was 2 feet, and by this arrangement the girls were able to measure off the correct length of string, and the need for making constant decisions about the length was obviated.

The experiment was begun in October and continued with a break of one week until the 14th December.

During the first part of the experiment, before the break, 12 girls worked for an average 27-hour week and their times of performing the repetitive task were recorded. 15 girls were trained during the first weeks, and of these 12 were employed on bell-wiring while 3 kept up their practice at machine knitting. Thus

it was impossible to obtain consecutive records for each girl as the records were interrupted by these days of machine knitting. During this part of the experiment the records were also interrupted by the unexpected failure of supplies of wire at frequent intervals. This was very disorganising, and the effect on the girls of knowing that supplies were running out was bad, from the point of view of uniformity of work and effort. It soon became evident that there were large individual differences in the speed of work. The experiment was then made of dividing the work into two processes, (1) " forming," which is the insertion of the wires into the boards, and (2) " lacing," which is the binding of the wires together. A double set of boards was provided so that this division of task might work effectively. It was thought that some of the girls worked better when given one operation only to perform. One totally blind worker did " forming " only and 3 girls " laced " her work. There was such an increase at this time due to the effect of practice that it is impossible to say whether this division of work resulted in increase of output but it was preferred by the girls themselves and it appeared that they got on more quickly.

It was found by the telephone company that too much time was spent by them in finishing the articles " formed " and " laced " by the blind workers. These had to be re-inserted in boards, the wires cut to appropriate lengths and half an inch of insulation stripped from the ends of each wire. It was decided to try the experiment of having the whole operation finished by the blind workers.

This experiment was tried in the second part of the research. It was arranged that 9 girls should be employed without break on the work of " forming " and " lacing." The 2 girls with the best sight, along with a girl of normal vision, specialised in " cutting and stripping." There was already a double supply of boards. The " formed " and " laced " articles were left in the board, which was passed to the 3 " strippers "

who finished it off, removed it from the board and returned the board empty. To allow this division of labour to work smoothly it was necessary to provide more than double the supply of boards and there were 22 boards in use in the last days of the experiment. It was found that at this stage of practice 9 girls were able to carry out the week's contract of 1,500 sets of wires, working for only 24 hours per week, while before the sub-division of labour took place it took 12 workers (9 " forming " and " lacing " and 3 " cutting and stripping ") to achieve the same output.

Factors Influencing Rate of Work.

The speed of work and the fluctuations in speed were influenced by various factors such as the classes which the girls attended several times a week. After the drill class, for example, the work was apparently slower and after an hour's singing lesson, the speed appeared to increase.

The daily records show that the output of the most careful workers varied most, and this, it is thought, was due to the fact that they were apt to pull too hard on the string and break it, thus causing delay in knotting up. When the workers were told what times they were taking over the operation there was a marked increase in speed. It was found that the best results were obtained when 2 girls working at approximately equal rates were placed opposite one another. Competition was aroused and output increased.

Quality of Results.

There were no complaints as to the quality of the work done by the blind workers. Before despatching the finished sets the investigator looked them over and kept back any imperfect work. This proved to be a necessary precaution as wires inevitably were sometimes mistaken. The percentage of spoiled work was astonishingly low, especially in the latter part of the experiment.

Output.

The output of the blind workers averaged 5.2 sets per hour, a number which compared very favourably with the 6 sets per hour required by the Telephone Manufacturing Co. of its workers. One group of blind workers undertook the work of "forming and lacing," and another group that of "cutting and stripping": a single group of sighted workers perform the complete series of operations.

We understand that since the date of the experiment the telephone company have increased their requirements and obtain a higher output, but even so, the blind workers compare favourably, considering their disability. The weekly wage of girls engaged on this work at the Telephone Manufacturing Company was 15/-. The actual earnings of the blind workers may be put at 10/-.

The number of people who took part in the experiment was small. The conclusions are only tentative. But some rather striking points emerge from a study of the figures set out in Tables I, II and IIa.

Tentative Conclusions.

The Swiss Cottage experiment confirmed one conclusion already arrived at by psychological analysis, namely, that skill in carrying out a movement depends on both a muscular control which is independent of vision, and a visual control. To take an example—in writing, although the movements are almost automatic, vision controls the alignment of the writing and prevents degeneracy in the form of the letters, and, as is well known, a blinded man's handwriting degenerates considerably even when other controls such as raised lines are used. A blind person, therefore, can acquire high degrees of skill only in those activities which are truly independent of vision, *i.e.*, those in which *effective* substitutes for visual control can be developed. Of the girls engaged in the Swiss Cottage experiment those who retained a sufficient degree of vision to identify colours and forms became the most

proficient (see Table III). To what extent they actually used their eyes it is impossible to say, but their superiority in output can hardly be due to chance. It was apparent that even a little assistance in the location and identification of objects materially reduced the time spent in completing a series of manual operations.

This was even more clearly demonstrated by the tests of manual dexterity, which were given to the girls who were to take part in the experiment with a view to obtaining information about their ability. In two of those tests pegs (narrow cylinders of wood) were taken one by one from a box and placed in holes in a wooden board. In another test nuts were screwed on to small bolts, the bolts being in a pile to the left of the worker, the nuts in a pile on the right. In the fourth test a similar screwing movement was involved, but the article was much larger (a double-ended wire strainer) and there was no picking up and transfer of objects from one position to another. Table III in the Appendix makes it evident that, with the exception of test (d), viz., threading thumbscrews on double-ended wire strainers, an operation for which no vision is required, the time taken by a totally blind person was much greater than that taken by one who could see a little. The reason was simply that the latter spent much less time in groping for material. This waste of time due to "groping" may be much reduced by suitable lay-out and special apparatus, but it cannot be wholly avoided. It seems, therefore, that if totally blind persons are to work at anything like full efficiency they must be employed on processes in which either vision is unnecessary or effective substitutes for vision can be developed.

Numerous jobs falling into the above categories are to be found in most sighted factories where repetitive processes are carried out ; this fact is clearly indicated in reports received from Canada, Germany and the U.S.A., where totally blind persons are employed on simple repetitive jobs, in which jigs or other artificial

aids can be employed, *e.g.*, drilling, broaching, threading bolts, etc.

On such processes the efficiency of blind workers frequently rises to 100% or higher.

These results indicate that the suitability of a particular process in a factory must be very carefully considered. It is not just a question of " Can a blind person do the work ? "—for there are clearly many processes which even the totally blind worker can perform but at a wholly uneconomical rate. The important point is rather—what is the influence of vision in maintaining high output, and what percentage of an average output can be expected from a person of defective vision ? It is clear that there are two factors to consider—the nature of the process itself, and the degree of vision (and also manipulative skill) of the person to be considered for the work. It is by no means certain that because some " blind " workers have become 80% efficient (or approximately so) on work of certain kinds, a general claim may be made for the employment of blind persons in industrial processes. Rather must we examine the conditions of the work in which such a high efficiency was attained, as well as the training, experience and qualities of those who reached it.

In issuing this Bulletin the Committee does not claim as yet to have made any notable advance. Its function has been rather to clear the ground and lay foundations. The actual placements effected have been few : but they are significant and indicative. The sub-contracting research will, it is hoped, be carried further by workshops and, possibly, by home workers' schemes. Further Bulletins will deal with the development of new trades in the workshops, present workshop practice, the placement of the higher educated blind, and any other aspects of the problem which may from time to time be presented.

TABLE I.

Table Showing Effects of Practice. Bell-Set Forming Experiment.

Worker	Rank for Vision see table II	No. of hours practice during training period	Average number of sets ** made per hour for each period of training				Average number of sets made per hour during final fortnight	Average time to make one complete set in final period of practice	Shortest time taken	Longest time taken	Rank for proficiency in bell-set making
A.	2	67	9.3	9.95	10.3	9.6	stripping —	6 mins.	$4\frac{1}{4}$ mins.	$7\frac{1}{2}$ mins.	3
B.	2	72	3.6	4.2	4.1	4.8	5	12 ,,	$8\frac{1}{2}$,,	18 ,,	11
C.	2	59	—	5.6	5.95	6.7	8.1	7.4 ,,	$5\frac{1}{4}$,,	12 ,,	8
D.	5	71	10.1	9.8	10.5	10.2	stripping —	5 ,,	$4\frac{1}{2}$,,	8 ,,	4
E.	5	60	—	5.3	6.3	6.4	7.5	8.2 ,,	$5\frac{1}{2}$,,	15 ,,	9
F.	5	47	—	—	7.6	7.8	9.2	6.4 ,,	5 ,,	$8\frac{1}{2}$,,	5
G.	$7\frac{1}{2}$	37	—	—	8.0	8.2	9.2	6.5 ,,	$4\frac{1}{2}$,,	$9\frac{1}{4}$,,	6
H.	10	80	3.6	6.4	6.5	7.9	8.2	6.6 ,,	$4\frac{1}{4}$,,	11 ,,	7
I.	10	58	—	6.9	7.5	8.8	10.9	5.4 ,,	4 ,,	$7\frac{1}{4}$,,	1
J.	10	57	—	2.8	5.2	6.2	—	—	—	—	12
K.	$7\frac{1}{2}$	41	—	—	3.7*	7.9	10.8	5.5 ,,	$4\frac{1}{2}$,,	7 ,,	2
L.	$13\frac{1}{2}$	86	4.6	6.2	6.1	5.8	5.7	10.5 ,,	$5\frac{3}{4}$,,	17 ,,	10
M.	$13\frac{1}{2}$	63 lacing only	—	3.7	3.9	5.0	—	—	—	—	14
N.	$13\frac{1}{2}$	54 ,,	—	5.4	5.7	7.3	—	—	—	—	13
O.	$13\frac{1}{2}$	94 forming	11.6°	14.1	16.8	18.3	—	—	—	—	15

** The period of training has been divided into four periods of approximately 20 hours each.

* K. spent only 3 hours on complete sets during this period. 17 hours were spent in lacing. Average output 6.5 per hour.

° O.'s output on complete sets during the first period of practice was 2.95. Subsequently she did forming only for temperamental reasons.

N.B.—When 2 or more people have the same rank, the average rank held by them is assigned to each one.

TABLE II.

Table Showing Order of Merit of Girls Taking Part in Bell-Set Forming Experiment.

Worker	Oculist's Report	Quality of Vision	Vision Ranked	Intelligence Tests	Dexterity Tests See Table IIa. (a)	(b)	(c)	(d)	Composite † Ranking for Dexterity	Rank for output in Bell-set Experiment	Rank for Proficiency in learning Knitting trade (Teacher's estimate) Beginning of Training	End of Training
A.	$\frac{6}{60}$ fingers	Colours, forms	2	10½	5	5	4	13½	6	3	2	2
B.	Fingers	,, ,,	2	6	14	15	14	6½	13½	11	13	13
C.	$\frac{6}{60}$ fingers	,, ,,	2	8½	11	13	12	12	12	8	10	10
D.	$\frac{4}{36}$ $\frac{4}{60}$	,, ,,	5	2	4	11	1	8	5	4	8	8
E.*	Fingers	,, ,,	5	—	3	6	6	3	3	9	4	3
F.	$\frac{4}{60}$ $\frac{4}{60}$	,, ,,	5	—	2	3	3	4	2	5	9	9
G.	$\frac{2}{60}$ fingers	,, ,,	7½	4	6	10	10	9½	10	6	6	6
H.	Shadows	Colours only	10	8½	8	8	8	15	11	7	7	7
I.	Light and darkness	No colours, forms vague	10	3	7	2	5	9½	4	1	5	5
J.	—	Colours not clear	10	10½	9	9	13	2	9	12	14	14
K.	$\frac{3}{60}$ $\frac{0}{60}$	Colours, forms	7½	1	1	4	2	1	1	2	1	1
L.	No vision	—	13½	5	10	7	7	5	7	10	3	4
M.	,, ,,	—	13½	12	13	14	9	13½	13½	14	11	11
N.	,, ,,	—	13½	7	12	1	11	6½	8	13	12	12
O.	,, ,,	—	13½	13	15	12	15	11	15	15	15	15

* Deaf also.

† The rank is obtained by summating the ranks of the workers in the tests (a), (b), (c), and (d), and arranging the summations in order of merit, the lowest summation counting as the highest rank.

TABLE IIA.

Showing Relations between the Rank Orders Given in Table II.

The Agreement between any two rank orders is conveniently expressed as a coefficient of correlation. When the two rank orders are identical this coefficient is unity. When there is no agreement between them the coefficient is zero. In the following table the lowest correlation that can be regarded as showing any agreement between two rank orders arising from factors other than purely chance ones is .43.

	Rank order for:	1	2	3	4	5	6	7	8	9	10
1	Quality of Vision	—	.53	.25	.28	.25	.45	.13	.27	.05	.30
2	Output on bell-sets	.53	—	.76	.76	.73	.81	.48	.79	.05	.72
3	Present proficiency in trade	.25	.76	—	.99	.70	.74	.51	.77	.10	.60
4	Future proficiency in trade	.28	.76	.99	—	.72	.76	.52	.78	.12	.60
5	Dexterity tests composite	.25	.73	.70	.72	—	—	—	—	—	—
6	,, ,, (a) Placing cylindrical wooden pegs in holes ..	.45	.81	.74	.76	—	—	.58	.85	.42	—
7	,, ,, (b) Placing cylindrical wooden pegs in holes ..	.13	.48	.51	.52	—	.58	—	.55	.36	—
8	,, ,, (c) Screwing nuts on bolts	.27	.79	.77	.78	—	.85	.55	—	.20	—
9	,, ,, (d) Threading thumb-screws on double-ended wire strainers	.05	.05	.10	.12	—	.42	.36	.20	—	—
10	Intelligence	.30	.72	—	—	—	—	—	—	—	—

N.B.—The Table of Correlations is interesting chiefly in that it brings out the following points:

(1) Output on the bell-set making process shows a fairly high degree of agreement with present proficiency in learning machine knitting.

(2) There is a similar relation between the dexterity tests and proficiency in the trade.

TABLE III.

TABLE SHOWING DIFFERENCES BETWEEN GROUPS CLASSIFIED ACCORDING TO DEGREE OF VISION.

	GROUP I. Girls who see Colours and Forms	GROUP II. Girls who see Light and Dark	GROUP III. Totally blind girls	Elementary School Children of 14 years of age
Number in group ..	8	3	4	600
Average Score in Test A	234.7	258	311.7	196
,, ,, ,, B	335.4	294.7	344.7	228
,, ,, ,, C	692.1	742	814.7	420
,, ,, ,, D	99.4	107	105	104

(NOTE :—Lower scores are best). Tests A and B:— Placing cylindrical pegs in holes.
Test C :— Screwing nuts on bolts.
Test D :— Threading thumbscrews on double-ended wire strainers.

The relative inferiority of the blind and partly blind worker in a task which requires not only speed of movement but accuracy of placing in position is shown by the fact that in three of the Tests (A, B, C) the average of even the best of the partly blind workers is not equal to that of the lowest ten per cent. of an average school population of fourteen years of age. In Test D, which does not require any movement from one position to another, the totally blind obtain a score equal to the average for elementary school children of fourteen years of age.

The progressive influence of the loss of vision is clearly shown by the differences in the figures, for although the numbers are small the magnitude of the differences is sufficient to indicate the general trend.

PRINTED BY
PORTEOUS LTD. E.1

Pamphlet Binders

This is No. 1526

also carried in stock
in the following sizes

	HIGH	WIDE	THICKNESS
1525	9 inches	6 inches	½ inch
1526	9¾ "	7⅛ "	"
1527	10½ "	7⅜ "	"
1530	12 "	9⅛ "	"

Other sizes made to order

MANUFACTURED BY

Library Bureau

Division of
Remington Rand Inc.
Library supplies of all kinds